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# INSECT AND DISEASE EVALUATION CROSS-FLORIDA BARGE CANAL PROJECT EUREKA POOL - 1975

By

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## INTRODUCTION

The clearing and disposal of forest trees currently planned for the Eureka pool poses potential epidemic source spots for insect and disease occurrence which could adversely affect the remaining forest communities in the project area. In addition, changes in the hydrologic regime of the forested area along the canal route due to canal operations may potentially result in a decline of vigor of tree species inhabiting the project area and may result in insect- and/or disease-caused mortality.

The present environmental impact statement is being prepared under the request and supervision of the Corps of Engineers to accompany the 1975 restudy report. The basic framework of the regional study includes baseline conditions as well as future conditions anticipated with and without any particular alternative course of action. Two basic alternatives involving (1) completed canal, and (2) uncompleted canal, were expressed in the July 9, 1974 plan of study. These two alternatives are further described as follows:

1. Completed canal
    a. Authorized alinement
    b. Eureka to Highway 40 nonriver alinement
    c. Eureka to Bert Dosh Lock nonriver alinement
    d. Summit reach plans
    e. West end plans
2. Uncompleted canal
    a. Preserve completed works
    b. Restore original condition
    c. Abandonment

## OBJECTIVES

The objective of the overall Cross-Florida Barge Canal study is to prepare a restudy report including an environmental assessment and analysis of the previously expressed engineering alternatives and updated economic studies for the Cross-Florida Barge Canal project.

Specific objectives of this insect and disease evaluation are:

1. Evaluate present insect and disease conditions on forest tree species along the proposed canal routes and in the adjacent forested area in the Eureka Pool.

2. Predict future insect and disease activity and impact on trees in the Eureka Pool and on the forested area along the canal route as a result of canal construction and changes in the hydrologic regime caused by canal operations.

## EVALUATION METHODS AND PROCEDURES

An orientation trip was made of the Eureka Pool during the first week of June 1975 to become familiar with the proposed canal routes and obtain preliminary data concerning insect and disease occurrence.

A more detailed evaluation was conducted in selected forest tree populations in the Eureka Pool during the period July 7-11, 1975. Five permanent plots, previously established by the vegetative mapping study group, were examined in populations 00, A, and B in the Eureka Pool (Fig. 1). In addition, two similar plots in population 01 (Rodman plots) below the Eureka Dam were examined for comparative purposes.

All trees on each plot were systematically examined for insect occurrence or damage and disease symptoms or fungus signs (fruiting bodies). Insect and fungus specimens were collected from the plots for laboratory identification and additional observations.

## RESULTS

### Insects

Individual tree examination within the permanent plots revealed two forest insect groups, the hardwood borers and defoliators. A few other insects were observed along the Ochlawaha River bank during the orientation trip

Figure 1. One of the permanent vegetative study plots examined for insect and disease occurrence in the Eureka Pool - July 1975.

in June. These were various gall insects, spider mites and the black turpentine beetle.

The Columbian timber beetle, *Corythylus columbianus*, is potentially the most important insect observed in the permanent plots attacking red maple (Table 1, Fig. 2). This ambrosia beetle was found in only one tree in population 00 - plot 10, but it was observed in a few large red maples outside the permanent plots and scattered along the Ochlawaha River. Within tree infestations by this insect was very light and considered not significant. The population of this particular beetle in the Eureka Pool area could be considered normal for this type of site.

The ash borer, *Podosesia syringae syringae* was also observed in scattered ash along the Ochlawaha River during the preliminary trip but not in significant numbers (Table 1).

The defoliators detected were the red humped oak worm, *Symmerista albifrans*, the variable oak worm, *Heterocampa manteo*, and the spiny oak worm, *Anisota stigma*. The larvae of these particular defoliators were observed feeding on live oak in population A - plot 3.

A bark beetle, the black turpentine beetle, *Dendroctonus terebrans*, was observed in a single tree in a loblolly pine plantation on the east bluff of the Ochlawaha River, approximately 3-4 miles north of Highway 40 (Table 1). Only four successful attacks were found on this tree.

## Diseases

A number of fungi were detected during both the preliminary and permanent plot examinations in the Eureka Pool (Table 1, Figs. 3 and 4). The majority of these fungi, however, were associated with dead trees and are considered to be secondary saprophytes that survive on dead host material (Fig. 3). The few exceptions included the velvet-top fungus, *Polyporus schweinitzii* (Fig. 4A), associated with root and butt rot, mortality and fusiform rust, *Cronartium fusiforme*. These two fungus pathogens were detected in one isolated natural loblolly pine stand on the east bluff of the Ochlawaha River approximately 3-4 miles north of Highway 40. The root- and trunk-rot fungus, *Polyporus lucidus (Ganoderma lucidum)*, was also observed fruiting on the roots, stem, and around the base of several living tree species (Fig. 4B). This fungus is normally a weak pathogen, however, it may cause disorders such as root mortality but usually not tree mortality.

The insect and fungus incidence along with tree mortality observed on the five Eureka and two Rodman vegetative study plots are summarized in Table 2. Insect and disease occurrence, as well as tree mortality, was very low (less than 6 percent) on all the plots examined.

Table . Fungi and insects collected from trees in Eure... and Rodman Pools and adjacent forested area - Ju..e and July, 1975.

| Organism | Hosts | Host Condition | Location on Host | Disease or Insect Type | Area Location |
|---|---|---|---|---|---|
| Fungi | | | | | |
| *P. schweinitzii* | Loblolly Pine | Dead | Roots | Root & Butt-Rot | East Bluff - Ochlawaha River |
| *Cronartium fusiforme* | Loblolly Pine | Living | Branch | Branch & Stem Canker | East Bluff - Ochlawaha River |
| *P. lucidus* | Red Maple | Living | Roots | Root & Butt-Rot | Pop. 01, Plot 01 1/ |
| | Green Ash | Living | Stem | Root & Butt-Rot | Pop. B, Plot 03 |
| | Palm | Living | Stem | Root & Butt-Rot | Pop. 01, Plot 01 1/ |
| *F. connatus* | Black Gum | Dead | Stem | Root & Butt-Rot | Ochlawaha River Bank |
| *F. fomentarius* | Black Gum | Dead | Stem | Butt & Heart Rot | Rodman Reservoir near Orange Springs |
| *F. applanatus* | Black Gum | Dead | Basal Stem | Heart Rot Slash Destroyer | Ochlawaha River Bank |
| *Pleurotus* sp. | Elm | Dead | Bole | Stem Rot | Pop. 1 - Plot 1 1/ |
| | Elm | Dead | Bole | Slash Destroyer | Pop. 00 - Plot 2 |
| *P. versicolor* | Black Gum | Dead (Stump) | Stump | Slash Destroyer | Rodman Reservoir Orange Springs |
| *P. pargamenus* | Black Gum | Dead (Snag) | Lower Stem (Snag) | Slash Destroyer | Rodman Reservoir Orange Springs |
| *Hypoxylon* sp. | American Holly | Dead | Stem | Stem Rot | Pop. 1 - Plot 1 1/ |
| | Elm | Dead | Stem | Slash Destroyer | Pop. 00 - Plot 2 |
| | Ash | Dead | Stem | Slash Destroyer | Pop. 00 - Plot 10 |
| | Ash | Dead | Stem | Slash Destroyer | Pop. B - Plot 3 |
| *Armillaria mellea* | Red Maple | Dead (Snag) | Lower Stem | Butt-Rot | Pop. 00 - Plot 10 |
| Foliage Fungi (*Phyllosticta*) | Red Maple, Ash Gum, Holly | Living | Leaves | Foliage Disease | Ochlawaha River Bank Pop. B - Plot 3 |
| Insects | | | | | |
| *Corthylus columbianus* | Red Maple | Living | Main Stem | Borer | Pop. 00 - Plot 10 |
| *Symmerista albifrons* | Live Oak | Living | Leaves | Defoliator | Pop. A - Plot 3 |
| *Heterocampa manteo* | Live Oak | Living | Leaves | Defoliator | Pop. A - Plot 3 |
| *Anisota stigma* | Live Oak | Living | Leaves | Defoliator | Pop. A - Plot 3 |
| *Dendroctonus terebrans* | Loblolly Pine | Living | Main Stem | Bark Beetle | East Bluff - Ochlawaha River |
| *Podosesia syringae syringae* | Ash | Living | Lower Stem | Borer | Ochlawaha River Bank - Several Locations |

1/ Rodman Reservoir plots.

Table 2. Incidence of insects and disease and tree mortality observed on seven plots in the Eureka and Rodman Pools and adjacent *forested area - June and July, 1975*

| Population No. | Plot No. | Total No. | Trees Dead No. | % | Disease Present No. | % | Insects Present No. | % |
|---|---|---|---|---|---|---|---|---|
| 00 | 2 | 42 | 2 | 4.8 | 1 | 2.4 | 0 | 0 |
| | 10 | 55 | 3 | 5.5 | 5 | 9.1 | 1 | 1.8 |
| A | 1 | 58 | 2 | 3.4 | 1 | 1.7 | 0 | 0 |
| | 3 | 43 | 0 | 0 | 3 | 7.0 | 2 | 4.7 |
| B | 3 | 50 | 3 | 6.0 | 3 | 6.0 | 0 | 0 |
| 01 1/ | 1 | 64 | 1 | 1.6 | 2 | 3.1 | 0 | 0 |
| | 7 | 61 | 5 | 8.2 | 6 | 9.8 | 0 | 0 |
| Totals | | 373 | 16 | 4.3 | 21 | 5.6 | 3 | 0.8 |

1/ Rodman Reservoir.

Figure 2. Columbian timber beetle, *Corythylus columbianus*, damage to red maple in permanent plot 10, population 00, Eureka Pool, July 1975. This is the ambrosia beetle damage commonly seen in hardwood lumber.

3A

3B

Figures 3A and 3B. Two saprophytic slash-destroying fungi observed in the Eureka Pool - July 1975. *Pleurotus* sp. on dead elm bole (3A) and *Fomes applanatus* on dead black gum bole (3B).

4A

4B

Figures 4A and 4B. Two parasitic root- and butt-rot fungi observed in the Eureka Pool - July 1975. *Polyporus schweinitzii* on roots of dead loblolly pine (4A) and *P. lucidus (Ganoderma lucidum)* on roots of living red maple (4B).

## DISCUSSION AND CONCLUSIONS

### Insects

The forest insects detected and observed during this evaluation are not major forest pests that cause tree losses in large numbers. The insect borers mentioned are primarily important from the standpoint of lumber degrade, not tree mortality. The defoliators are considered mid- to late-summer feeders and usually do not cause a considerable amount of growth loss or mortality. It is probable that the borer population will increase when and if the Eureka Pool is flooded, as indicated by J. D. Solomon in his evaluation of the forest insect situation in the Rodman Reservoir (unpublished mimeographed report, U.S.F.S., Southern Forest Experiment Station). Solomon indicated that the numbers of borer attacks increased as he moved from his check plots into the flooded plots of the Rodman Pool.

Another insect group that was observed in a loblolly pine plantation located on the east bluff (18 feet MSL) of the Ochlawaha River was the black turpentine beetle, one member of the southern pine bark beetle complex. Bark beetles can cause tree mortality and do favor stressed trees. In this particular incidence, however, due to the high bluff, flooding should not affect the vigor of this particular stand of timber. In other locations of scattered pine, flooding could cause individual tree stress on lower sites. Here, there is a possibility of tree killing by bark beetles. However, any bark beetle activity would be considered secondary to the real stress factor, flooding. In the forest, endemic populations of bark beetles are always present in trees subjected to natural mortality or stress factors such as wind damage, lightening strikes, diseases, etc. This indicates that there is always a possibility of some activity in stressed or weakened trees anywhere in the forest community.

### Diseases

Based on data collected during this evaluation, there is no indication that tree diseases caused by fungi are or will be a major factor in tree mortality in the Eureka Pool. The most probable tree mortality and stress problem in the Eureka Pool is likely to be the physiological nonparasitic disease caused by the excess water when the water level is raised. Considerable tree mortality and stress is already evident throughout the Rodman Reservoir where continuous flooding of tree roots has occurred (Fig. 5). These tree mortality and stress conditions will continue throughout the flooded areas unless the water is lowered during the growing season to eliminate the excess soil water and restore adequate oxygen levels around the tree root systems. In a previous evaluation, T. H. Filer,

Figure 5. Severe widespread mortality (90+ percent) observed on a variety of hardwood and conifer species in the continuously-flooded upper (southwest) end of the Rodman Reservoir - July 1975.

Plant Pathologist, Southern Forest Experiment Station, Stoneville, Mississippi (unpublished mimeographed report - 1972), recommended that the water level in the Rodman Reservoir be lowered to 13 feet MSL during the growing season to minimize tree root mortality. This recommendation also seems appropriate for the Eureka Pool where flooding conditions will be similar to those in the Rodman Reservoir.

The root and butt-rot fungus, *P. schweinitzii*, has caused noticeable mortality (5-10 percent) in the one isolated natural loblolly pine stand on the east bluff of the Ochlawaha River. This mortality will probably continue to increase in this stand during the next several years regardless of flooding conditions. The stand is located on a high bluff (over 18 feet MSL) above the east river bank and should not be affected by any flooding in the adjoining area. This parasitic fungus enters susceptible conifers such as loblolly pine primarily through wounds, viz. fire, root and lower stem wounds, and basal fusiform rust cankers.

Although several root, butt, and stem-rot fungi such as *P. lucidus, F. fomentarius,* and *F. connatus* were found fruiting on the roots and lower stems of several hardwood tree species, there are no indications that these fungi have been or will be a major problem on the natural hardwood stands in the Eureka Pool and adjacent forested area. The majority of the hardwoods appeared very healthy and vigorous and apparently not affected by any of these fungus diseases. In addition, Filer (Rodman evaluation report, 1972) found less fungus inoculum potential in the flooded Rodman Reservoir area than in the adjacent natural forested area. This condition was also found in a study conducted at the Southern Hardwoods Laboratory - Stoneville, Mississippi - where prolonged flooding apparently reduced the populations of aerobic soil microflora and root inhabiting fungi.

Finally, the leaf spot and blight fungus diseases observed on hardwood species such as maple, ash, gum, and holly in several areas are not considered to be a factor in tree mortality. At worst, they may cause some reduction in tree growth due to a reduction in the photosynthetic leaf surface area.

Based on information collected during this evaluation, forest insects and fungus-caused diseases will probably play a minor role in tree mortality if the Eureka Reservoir is flooded.